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A REVIEW OF BORNEAN ZINGIBERACEAE: IV (GLOBBEAE)

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ABSTRACT. *Globba*, the sole Bornean representative of the tribe Globbeae, is reviewed. One new species, *G. muluensis* is proposed as well as three new varieties, *G. tricolor* var. *gibbsiae*, *G. brachyanthera* var. *rubra* and *G. brachyanthera* var. *hirsuta*. A key to the species and varieties is provided.

*Globba* is a well defined genus easily recognized by its small, delicate flowers with long arching filaments and, in the species dealt with below, lateral anther appendages. It is the sole Bornean representative of the tribe *Globbeae*. There are possibly less than 100 species, the greatest number concentrated within the northern monsoon areas of tropical Asia, but the genus is well represented in Malaysia and occurs to a lesser extent in Indonesia and New Guinea. The classification of *Globba* has long been based on the number of anther appendages arising on either side of the anther. Three sections were erected by Horaninow (1862).

*Haplanthera*—appendages absent (no Bornean representative).

*Ceratanthera*—appendages one on each side (Bornean species: *G. brachyanthera* (syn. *G. affinis*, *G. burbidgei* p.p), *G. franciscii* (syn. *G. argentiana*), *G. glandulosa*, *G. muluensis*, *G. pendula* (syn. *G. burbidgei* pp., *G. debilis*, *G. polyphylla*), *G. pumila*, *G. tricolor* (syn. *G. gibbsiae*)).

*Marantella*—appendages two on each side (Bornean species: *G. atrosanguinea*, *G. propinqua* (syn.: *G. paucibracteata*)).

To these sections must be added the monotypic sect. *Nudae* K. Larsen in *Notes RBG Edinb.* 31:235 (1972). *G. nuda* K. Larsen has two appendages per side and is not known outside N Thailand.

K. Schumann (1904, p. 133) further subdivided sect. *Ceratanthera* into three series, the names of which describe their character: *Apicalcarata*, *Mediocalcarata* and *Basicalcarata*. It is the last two series which concern us here and, of Bornean species, only the otherwise distinct *G. franciscii* may be indisputably placed in series *Mediocalcarata*. Series *Basicalcarata* is problematic, it is described as having the anther 'provided with basal pendulous or horizontal spurs'. This condition is often difficult to distinguish from *Mediocalcarata*, for in *G. brachyanthera* and *G. muluensis* the appendages project more or less horizontally from the lower part of

the anther from a broad base which forms part of the connective and is decurrent along the sides of the thecae. In *G. pendula* and *G. tricolor* the appendages are pendulous from the base but are also decurrent. The character should be used with caution: the appendages of a newly opened flower may look remarkably different to those of the older flower and the shrivelled appearance of the anther as found in much herbarium material may be misleading.

Reliable, constant characters are scarce in *Globba*. Vegetatively the genus offers little, the leaves are sessile or subsessile (occasionally shortly petiolate in *G. propinqua*), the ligules always bilobed and, although the bristle-like hair along the lateral veins of the upper leaf surface of *G. pendula* is of diagnostic value, the density of leaf and sheath indumentum is rarely constant within a species. In sect. *Ceratanthera* flower colour too is often variable at specific level. This was demonstrated by Holttum (1950): his account of *Globba* in the Malay Peninsula enumerates 10 species, whereas Ridley (1924) had previously listed 21. This reduction is, not surprisingly, paralleled in the present treatment where the 16 species recorded from Borneo are reduced to eight.

The most dependable characters are to be found in the inflorescence which, in *G. tricolor*, *G. franciscii* and *G. pendula*, may elongate to up to 30cm while that of *G. brachyanthera*, for example, does not exceed 9cm. The number of flowers per cincinnus is important (but difficult to use when only young inflorescences are available), so too is the length of the cincinnus stalk. The depth of bilobing of the labellum and its relation to the insertion of the petals is often significant. There is some indication that the capsules vary but insufficient numbers have been collected. They should be sought, described, and, if possible, preserved in alcohol. Bulbils are rarely found on herbarium material, not because they are produced infrequently, but presumably because they are easily dislodged.

#### KEY TO THE SPECIES AND VARIETIES

1. Anther with two appendages on each side; capsule verrucose . . . 2
- + Anther with one appendage on each side; capsule smooth or ridged . . . 3
2. Bracts red or orange; lateral staminodes shorter than the petals  
1. *G. atrosanguinea*
- + Bracts green; lateral staminodes up to twice the length of the petals  
2. *G. propinqua*
3. Cincinni wide-spreading with up to 20 distinctly pedicellate flowers; filament with two short teeth a few mm above the base of the labellum; capsule flask-shaped . . . 3. *G. franciscii*
- + Cincinni wide-spreading or not, with 2-many  $\pm$  sessile flowers; filament edentate; capsule (where known) round . . . 4
4. Stems prostrate, 15-20cm long; leaves densely hairy above, giving a ribbed appearance . . . 4. *G. pumila*
- + Stems erect; leaves, if hairy above, not appearing ribbed . . . 5
5. Inflorescence becoming much elongated and pendulous; cincinni commonly 2-flowered; flowers yellow-orange, often with a dark spot at base of labellum; upper surface of leaves with (sometimes very

- sparse) bristle-like hairs on the lateral veins. . . . . 5. *G. pendula*  
 + Inflorescence congested, if becoming elongated then erect; cincinni  
 2-many-flowered; flower colour various; upper surface of leaves  
 pubescent all over, rarely glabrous . . . . . 6
6. Inflorescence elongating to 20cm; cincinni stalks (1-) 1.5-3cm long 7  
 + Inflorescence congested, under 9cm long; cincinni stalks under 1cm 8
7. Petals mauve-purple . . . . . 6. *G. tricolor*  
 + Petals white. . . . . 6a. *G. tricolor* var. *gibbsiae*
8. Cincinni 2-flowered; labellum deeply bilobed, reaching to the level of  
 the insertion of the petals . . . . . 7. *G. muluensis*  
 + Cincinni 6 or more flowered; labellum emarginate, not extending to  
 the insertion of the petals . . . . . 9
9. Inflorescence red, flowers yellow-orange . . . . .  
 8a. *G. brachyanthera* var. *rubra*  
 + Inflorescence white, flowers white and yellow . . . . . 10
10. Leaves hirsute on both surfaces . . . . . 8b. *G. brachyanthera* var. *hirsuta*  
 + Leaves practically glabrous . . . . . 8. *G. brachyanthera*

1. *G. atrosanguinea* Teysm. & Binn. in *Natuur. Tijdschr. Nederl. Ind.* 27:22 (1864). Fig. 1A.

Type: Hort. Bogor. originally from Borneo (n.v.)

Selected Bornean specimens:

SARAWAK: 1st Division, Mt Matang, c.2500ft, red bracts, orange flowers, 15 vii 1962, *Burt & Woods* B2528 (E); *ibidem*, inflorescence scarlet, 1 xii 1954, *Brooke* 9447 (BM); Padawan, Stabut, limestone slope, flowers red, 12 i 1970, *Mamit* S29838 (E); path from Bau to Bidi, bracts red, flower orange, 9 iii 1949, *Sinclair* 5679 (E); Bau, at the foot of the quarry hill, inflorescence scarlet, flowers buff, 8 xii 1955, *Brooke* 10841 (BM); 3rd Division, Hose Mts, B. Mabang—B. Sanpandai, red bracts, orange flowers, 6 vii 1967, *Burt & Martin* B4828 (E); Kapit distr., B. Tibang, ulu Balleh, 2900ft, rock below cliff, 14 vii 1969, *Paie* S29595 (E); Teneong, flowers scarlet, 2 x 1954, *Brooke* 9134 (BM); Muka Hill, flowers red, *Native collector* 5051 (UC); 4th Division, G. Mulu National Park, around camp at Long Tapin on S. Tutoh, 150-200m mixed dipterocarp lowland forest, sandstones and shales, bracts red crimson, petals pale orange, 29 iii 1978, *Jermy* 13876 (BM); *ibidem*, Gua Payau, on limestone rocks near river, c.100m, bracts bright orange, flower yellow-orange, 19 xi 1977, *Argent & Kerby* 792 (E); *ibidem*, on alluvial ground periodically inundated by water, bracts red, flowers yellow-orange, white bulbils, 19 xi 1977, *Argent & Kerby* 793 (E); G. Subis, Niah, wet alluvial forest floor at foot of limestone, light orange bracts and pink-yellow flowers, 5 vi 1962, *Burt & Woods* B2024 (E); 7th Division, S. Brearan, riverside path, orange flowers, red bracts, 29 vii 1978, *Burt* 11351 (E).

SABAH: G. Lumarku, nr Sipitang, Mengalom to Milligan path, c.600m, red bracts with orange-buff flowers with brownish mark, 20 iii 1980, *Argent & Lamb* 1498 (E); S of Sinoa, Trus Madi, Interior Residency, 1800ft, primary rain forest in leaf litter, flowers yellow-orange, purple-red

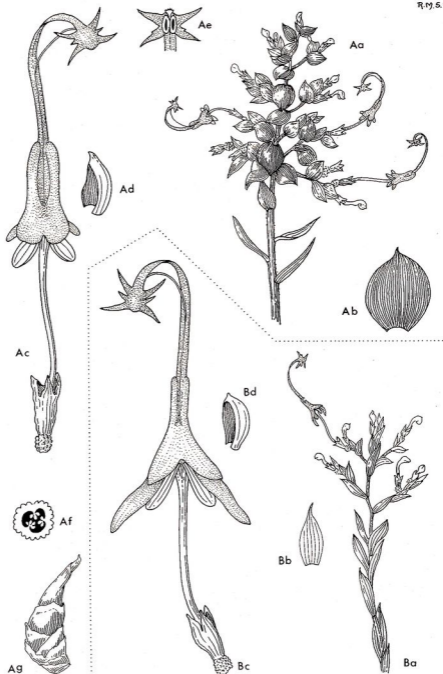


FIG. 1. A, *Globba atosanguinea*: a, inflorescence  $\times 1$ ; b, fertile bract  $\times 2$ ; c, flower  $\times 3$ ; d, dorsal petal  $\times 2$ ; e, anther and upper part of filament from the front  $\times 2$ ; f, ovary in T.S.  $\times 6$ ; g, bulbil  $\times 2$  (from living and spirit material of *Argent & Kerby* 792). B, *G. propinqua*: a, inflorescence  $\times 1$ ; b, fertile bract  $\times 2$ ; c, flower  $\times 3$ ; d, dorsal petal  $\times 3$  (a, from dried material of *Argent & Lamb* 1499; b, c, d from spirit material of *Burt & Woods* B 2726).

calyx, 23–30 viii 1977, *Gardner* 64 (E); Ranau Distr., rd from Lohan to Mamut Copper Mine near Tank 80, 900m, dipterocarp forest, 1m, bracts and calyx scarlet, corolla yellow, 9 vii 1984, *Beaman et al.* 10620 (E).

KALIMANTAN: between Long Bawan and Panado, c.3°52'N 115°42'E, 1100m, along stream Songay Pa Ariman, sandstone, bracts and perianth red, protruding part of flower light orange, 21 viii 1981, *Geesink* 9152 (L, E); *ibidem*, 12 vii 1981, *Geesink* 9027 (E).

*G. atrosanguinea* is widely distributed throughout Borneo and also occurs in Sumatra. The species has been known in cultivation for well over a century (*G. coccinea* Hort.) and the young inflorescence, with its broad brilliant red bracts and yellow-orange flowers is quite spectacular; in its later stages less attractive bulbils are produced in the axils of the lanceolate sterile bracts. When capsules are formed they are rounded and distinctly verrucose, a common occurrence in sect. *Marantella*. The elliptic, acute to acuminate leaves are almost invariably red on the lower surface.

2. *G. propinqua* Ridley in J. Str. Br. Roy. Asiat. Soc. 46:230 (1906). Fig. 1B.

Syntypes: Sarawak, 1st Division, Mt Matang, *Ridley* 12260 (n.v.); Lundu, ix 1904, *Ridley* s.n. (K).

Syn.: *G. paucibracteata* Val. in Ann. Bot. Jard. Bot. Buitenz. 31:23 (1921).

Type: Cult. Bogor, originally from central Borneo, *Nieuwenhuis* 1233 (n.v.).

Material seen:

SARAWAK: 1st Division, lower slopes of G. Lundu, leaves red-purple below, flowers pale orange yellow, inflorescence overarched, 7 vii 1962, *Burt & Woods* B 2726 (E); *ibidem*, 3 v 1954, *Brooke* 8405, 8382 (BM); 7th Division, Belaga District, S. Brearan, yellow flower with brown mark at base of staminodes, bulbils sometimes present, 29 viii 1978, *Burt* 11350 (E); 4th Division, G. Mulu National Park, c.70m, x 1977, *Argent & Kerby* 631/a (E).

SABAH: Royah Hills, nr Tenom, leaves red on lower surface, stem red, flower yellow, 2500m, i 1910, *Gibbs* 2885 (BM); G. Lumarku, nr Sipitang, Mengalom to Milligan path c.600m, bracts green, flowers orange with brown mark, 20 iii 1980, *Argent & Lamb* 1499 (E); nr Sinoa, S of Trus Madi, Interior Residency, 1800ft, primary rain forest, flowers yellow, leaves purple below, 23–30 viii 1977, *Gardner* 69 (E); Tambunan distr., nr trail from Tambunan to summit of Trus Madi, 800–900m, flowers yellow, 23 iii 1984, *Sands* 4019, cult. RBG Kew 24 vii 1985, acc. no. 302-84-03034 (K); Tambunan rd, 1250m, montane dipterocarp forest, flowers orange-yellow, 16 x 1983, *Beaman et al.* 7253 (E); Mt Kinabalu, Penibukan, below camp, flowers yellow, 11 iii 1933, *Clemens* 35206 (BM); *ibidem*, Dallas-Tenompok ridge, 3500ft, flowers yellow, *Clemens* 26801 (BM); *ibidem*, Penataran basin, Wusser falls, flowers cream, 28 vii 1933, *Clemens* 40198 (BM); *ibidem*, Koung, c.1250ft, 28 ii 1933, *Carr* 26275 (BM); *ibidem*, Liwangu trail, c.1800ft, flowers yellow-orange, 17 vi 1986 *Smith & Phillipps* S24/a/86 (E); Danum valley, between W0 & W1, 180m, on rocks in soil in primary rain forest, leaves dark green above, purple or

mid-green with purple tinge below, sterile bracts mid-green, flowering bracts greenish yellow, ovary and calyx greenish yellow, other parts bright yellow, lip with reddish or greenish brown spot, bulbils reddish green, 20 ix 1985, *Newman* 91 (E); Cult. Tenom Orchid Centre, Hort. A. Lamb, orange flowers, originally collected from Batang Urun, 10 vi 1986, *Smith* 5/86 (E).

*G. propinqua* differs from *G. atrosanguinea* in its smaller, green, flower bearing bracts and, in maturity, rather elongated cincinni with more numerous flowers. It has also much longer lateral staminodes and a more deeply lobed labellum. Although the type has not been seen, there seems no good reason not to include *G. paucibracteata* Val. in synonymy. Valetton knew Ridley's species only from the latter's inadequate description which fails to record the many-flowered cincinni and long lateral staminodes, and does not circumscribe the shape of the labellum correctly.

Ridley (1906) records the Sumatran and W Malaysian *G. patens* Miq. (as *G. aurantiaca* Miq.) for Borneo (*Korthals* s. loc., n.v.) & Merrill (1921) cites two Beccari collections (1318, 1614 n.v.) under the same name. These sheets should probably be referred here.

### 3. *G. franciscii* Ridley in J. Linn. Soc. Bot. 42:162 (1914). Fig. 2A.

Lectotype (selected here): Sabah, Tenom, flowers orange, 700–1000ft, i 1910, *Gibbs* 2932 (BM).

Syn. nov.: *G. argentiana* R. M. Smith in Bot. J. Linn. Soc. 85:38, fig. 8b (1982). Type: Sarawak, 4th Division, G. Mulu National Park, Gua Payau, in shade on limestone boulders by stream, c.100m, flowers orange, 19 xi 1977, *Argent & Kerby* 802 (E).

#### Material seen:

SABAH: Tenom Orchid Centre, hort. A. Lamb, originally from Kallang waterfall, pure orange flowers with darker spot on lip, curious filament appendages prominent, 10 x 1986, *Smith* 4/86; Kinabalu Park, flowers orange, xi 1915, *Clemens* 10177 (K, UC); *ibidem*, Tenomopok, flowers orange, 5000ft, ii 1931, *Clemens* 30278 (UC); Singh's Plateau, 3000ft, flowers yellow, 13 vi 1961, *Chew, Corner & Stainton* 1031 (K); *ibidem*, Poring Hot Springs, in forest, just above springs, yellow-orange flowers, 18 vi 1986, *Smith* 33/86 (E); *ibidem*, c.4mile on path to springs, 2000ft, orange flowers, 15 ii 1954, *Darnton* 166 (BM); *ibidem*, SW side of Lohan R, flowers orange, 5 iv 1984, *Beaman et al.* 9209 (E); Elphinstone province, Tawao, x 1923, *Elmer* 20550 (K, UC); Tanagat, Tawao, flower yellow, 15 xi 1926, *Sales* 3752 (UC); Lahad Datu distr., B. Tempadong, cliffs and hills along Segama R, 100–150m, jagged limestone slopes, flowers orange; 11 vi 1984, *Beaman et al.* 10080 (E).

SARAWAK: 4th Division, G. Mulu National Park, c.100m, limestone lowland forest, flowers pale orange, 31 vii 1978, *Jermy* 14229 (E); *ibidem*, on periodically flooded ground, c.70m, flowers yellowish-orange, some plantlets present, 30 x 1977, *Argent & Kerby* 629 (E); *ibidem*, x 1977, *Argent & Kerby* 630a (E); *ibidem*, limestone scree, very abundant, corolla pale orange, 7 x 1971, *Anderson* S31806 (E); *ibidem*, 50–75m, steep limestone scree, 25 ii 1978, *Nielsen* 12 (AUU).

KALIMANTAN: Batu Bini, nr Kendangau, flowers cinnabar red, *Grabowsky* s.n. (BM, syntype).

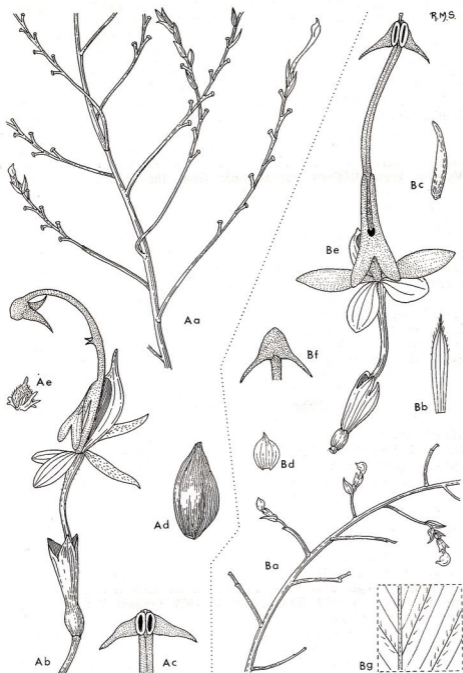


FIG. 2. A, *Globba franciscii*: a, part of old inflorescence  $\times 1$ ; b, flower  $\times 3$ ; c, anther and upper part of filament from the front  $\times 3$ ; d, capsule  $\times 2$ ; e, seed and aril  $\times 2$ . (a, from Smith 4/86; b, c from Argent & Kerby 802—all spirit material—d, e from Elmer 20550—dried material). B, *G. pendula*: a, part of old inflorescence  $\times 1$ ; b, sterile bract  $\times 1$ ; c, bulbil from lower part of inflorescence  $\times 1$ ; d, fertile bract  $\times 1$ ; e, flower  $\times 3$ ; f, anther and upper part of filament from the back  $\times 3$ ; g, part of upper leaf surface c.  $\times 1$  (all from spirit material of Smith 45/86).

*G. franciscii* is allied to the Sumatran *G. paniculata* Val. and *G. albiflora* Ridley of the Malay Peninsula, resembling both in the shortly peduncled, elongate inflorescence (up to 30cm long) with early deciduous bracts, and widespreading, long stalked cincinni of up to 20 distinctly pedicellate flowers. The anther appendages are also similar, spreading from the middle of each theca, their bases occupying the whole length of each side. *G. franciscii* differs in the long cucullate dorsal petal, more deeply bilobed labellum and in the curious appendages on the filament which arise c.4mm above the base of the labellum.

The lanceolate-caudate leaves are practically glabrous, ligule and sheaths are at least sparsely pubescent. The flowers are yellow-orange and bulbils have not been recorded. The capsules are, unusually for the genus, rather elongate and flask-shaped.

**4. *G. pumila*** Ridley in J. Str. Br. Roy. Asiat. Soc. 46:231 (1906).

Type: Sarawak, 2nd Division, Puak, flowers white, ix 1905, Ridley 12357 (K).

Material seen:

SARAWAK: 1st Division, Padawan Bukit Sermandoh, 750m, growing in leaf mould/humus layer in rocky area in dense forest, wet and humid, leaves surviving very wet conditions, approximately 8in, stem pink, flowers white, good ground cover, 12 iv 1981, Dransfield & Marsh 14, cult RBG Kew with the following colour notes: flowers with mauve pedicels, calyx and buds; yellow lobed labellum, white filament and anther process, petals mauve, staminodes yellow; 16 iii 1982, *Kew acc.* 329-81-03575 (K); N slopes of Mt Penrissen, 500-700m, prostrate, stem bright red towards base, 1 vii 1958, Jacobs 5001 (K).

*G. pumila* is a small-leaved (lamina to 7 × 1.5cm) plant of prostrate habit with stems up to 20cm long. The upper leaf surfaces have densely hairy elevated lateral veins, giving a ribbed appearance; on the lower surface this pubescence is confined to the midrib and sometimes to the main lateral veins. Ridley's description confused the leaf surfaces. The inflorescence is 4-6cm long, the peduncle more or less equal to the length of the flowering part with one or two lanceolate sterile bracts. The cincinni are probably 3-5-flowered with ovate bracts. No complete flowers remain on the type, but it can be seen that the shortly lobed labellum does not reach to the insertion of the petals; the anther appendages are described as basal. The species is probably closest to *G. brachyanthera*.

The cultivated plant cited above is densely hairy on both leaf surfaces and further differs in the predominantly mauve and yellow flowers. Both Ridley and Dransfield & Marsh noted the colour of their wild collections to be white.

**5. *G. pendula*** Roxb. in Asiat. Res. 11:359 (1810) & Pl. Coromand 3: t.228 (1819). Fig. 2B.

Type: Ic. Roxb. in Asiat. Res. 11:359 (1810) & Pl. Coromand 3: t.228 (1819) from a plant collected from Penang (K).



Syn.: *G. polyphylla* K. Schum., Pflanzenr. Zing. 140 (1904). Type: Kalimantan, Prarawing Mts, *Korthals* s.n. (L).

*G. debilis* Ridley in J. Str. Br. Roy. Asiatic Soc. 54:56 (1909). Type: Kalimantan: Sambas R, Keelong, *Brookes* s.n. (K).

*G. burbidgei* Ridley in J. Bot. 63:204 (1925)—p.p. excl. lecto.

The following Bornean material probably belongs here:

SARAWAK: 1st Division, Serian, flower orange, 16 i 1955, *Brooke* 9559 (BM); Mt Singgi, old jungle, flowers yellow, 24 ii 1927, *Native collector* 5149 (UC); 3rd Division, Kapit distr., Balang/Balleh watershed ridge, extreme headwaters of Baleh R, primary forest, igneous (andesitic) derived soils, 2800ft, perianth saffron yellow, dark heart shaped mark at base of lip, 6 vii 1969, *Anderson* S28475 (E); Kelapaan, flowers bright orange, 18 vii 1954, *Brooke* 8830 (BM); 4th Division, G. Mulu National Park, between S. Melinau and S. Tarikan, plain orange flower, anther with outcurved basal appendage, cylindrical bulbils in inflorescence, 15 vi 1975, *Burt* 8285 (E); 5th Division, Bakelalan to Mt Murud, camp 1, orange flowers, 23 ix 1967, *Burt & Martin* B5175 (E); *ibidem*, Long Rapata, nr camp 2, pale orange, deeper at centre, stems and undersides of leaves suffused purple, 15 x 1967, *Burt & Martin* B5510 (E); Lawas, flower orange with many bulbils, 24 v 1955, *Brooke* 9970 (BM).

SABAH: G. Lumarku, nr Sipitang, Mengalom to Milligan path, flowers orange on a very elongated inflorescence, 20 iii 1980, *Argent & Lamb* 1500 (E); Kimanis to Keningau Rd, Crocker range, c.1200m, submontane rain forest, flowers entirely rich orange, stem mottled purple, leaves green above purple flushed below, *Argent* 1318 (E); *ibidem*, mile 13.5, 1100m, montane dipterocarp forest, flowers yellow, 23 ix 1983, *Beaman* 7033 (E); Mt Kinabalu, Dallas, 3000ft, flowers orange, leaves purple underneath, 13 viii 1931, *Clemens* 26073 (BM); *ibidem*, Penibukan, 2 ii 1933, *Brookes* s.n. (BM); *ibidem*, Penokok R, c.4000ft, 11 viii 1933, *Carr* 27928 (BM); *ibidem*, nr Kiau, plain yellow orange flowers, 20 vi 1986, *Smith* 48/86 (E); Danum valley research centre, lowland dipterocarp forest, 200m, flowers orange, 3 iii 1985, *Argent et al.* SAN 108302 (E); *ibidem*, sandy soil on steep shady stream bank, 200m, flowers orange, 24 ii 1985, *Argent et al.* SAN 108205 (E); *ibidem*, E track at E8 on path, flowers bright yellow, lip with red-brown spot, 3 ix 1985, *Newman & Pearce* 63 (E); B. Lugas, Kg. Himbaan, 8.5km SE of Tenompok, 1250–1300m, montane dipterocarp forest, flowers orange, 7 vii 1984, *Beaman et al.* (E); Ulu Menanam, Tongod, 500ft, primary forest, flowers yellowish, 27 ix 1978, *Dewol & Kodoh* SAN 89267 (K); Sepilok F.R., Elopura, compartment 3; flower cream, 4 xi 1947, *Kadir* A560 (K).

KALIMANTAN: s. loc., *Korthals* s.n. (L); between Long Bawan and Panado, 1000m, evergreen hill forest on sandstone, flowers entirely orange-yellow, 11 vi 1981, *Geesink* 9012 (L, E).

Roxburgh's first full description of *G. pendula* was published in 1819. He made no reference to the rather bristly pubescence on the main lateral veins of the upper leaf surface, which was later considered an important diagnostic feature in the separation of the closely related *G. leucantha* Miq. (Sumatra & W Malaysia) by both Holttum (1950) and Lim (1972). Examination of a collection from Penang—whence *G. pendula* was

described (Dr W. Hunter, E)—shows that such hairs are present, but so few as to be easily overlooked. In the Bornean plants these hairs may be quite conspicuous or almost absent, and shorter interveinous hairs, such as are found in *G. tricolor* var. *gibbsiae*, do not occur. *G. pendula* is a variable species, both morphologically and cytologically: in the Peninsula Lim (1972) recognized three subspecies, and it is possible that the Bornean element should be subdivided. At least two collections, *Burt* 8285 and *Argent & Lamb* 1500, have unusually long lateral staminodes, and in some cases the lower leaf surface, which is always glabrous in the Bornean plants, is purple. The collections from the Danum valley and other areas in E Sabah deviate in the shorter inflorescences and cincinni of 3–6 flowers. Typical *G. pendula* is characterized by the much elongated, long pedunculate inflorescences which bear few, usually (1–)2–3 orange flowered cincinni, all the bracts (sterile and flowering) are narrow and quickly deciduous, and the anther appendages point downwards from near the bases of the thecae. Bulbils are, according to some collectors' notes, not infrequently produced, but are rarely seen in the herbarium. The species also occurs in Thailand, Java and, probably, Sumatra. *G. debilis* Ridley, which has poor type material, is probably no more than a depauperate form.

The Sabah syntypes of *G. burbidgei* Ridley (E Coast, *Creagh* s.n., K; Sandakan, *Burbidge* s.n., K) seem most likely to belong here; no colour notes were recorded. Ridley's other syntype, of *G. burbidgei*, from Lundu in the 1st Division of Sarawak is dealt with under *G. brachyanthera* var. *strigosa* (no. 8b below).

K. Schumann cited a collection from G. Prarawing in Kalimantan as the type of *G. polyphylla* and, as this locality is not given elsewhere in *Das Pflanzenreich*, the sheet at L presumably represents this collection. It is, however, annotated in Schumann's hand as *G. maculata* Bl., a Javan species. In his monograph, Schumann treats *G. maculata* as a separate species and as a synonym of *G. pendula*, both these species being separated from *G. polyphylla* on their longer anther spurs. The type of *G. polyphylla* bears only young, and at such a stage, non-pendulous inflorescences, but the few-flowered cincinni and indumentum of the upper leaf surface indicate that *G. pendula* is the correct name for the Korthals collection.

**6. *G. tricolor* Ridley** in J. Str. Br. Roy. Asiat. Soc. 46:231 (1906).

Lectotype (selected here): Sarawak, 1st Division, Mt Matang, white and violet, vii 1903, *Ridley* 11806 (K).

Material seen:

SARAWAK: 1st Division, Mt Matang, 1911, *Ridley* s.n. (K); *ibidem*, stems spotted red, petals violet, staminodes, lip and anther yellow, i 1915, *Ridley* s.n. (K); *ibidem*, 2500–3000ft, *Mjoberg* s.n. (UC 315964, 315986); Kuching, ix 1904, *Ridley* 12360 (K, syntype of *G. tricolor*); *ibidem*, on wet ground under rubber, inflorescence pale mauve, 30 xi 1955, *Brooke* 10828 (BM); *ibidem*, Batu Kitang, old rubber plantation, mauve buds and pale mauve fruits, 13 ix 1955, *Purseglove* 4367 (K); Bau, flower white or tinged with blue, 22 iv 1955, *Brooke* 9838 (BM); G. Berumpet, Poi Range, c.3500ft, stems green or brownish purple mottled, leaves dark green

above, bluish purple below, buds dark mauve-purple, shining, 13 viii 1962, *Burt & Woods* B2825 (E).

KALIMANTAN: W Kutei, Kelindjau R near Malan, calyx purple, tube white, wings and top yellow, remainder of flower purple, 18 vi 1984, *Kostermans* 9660 (K).

*G. tricolor* is characterized by the long-stalked (to 3cm), usually 4-6-flowered cincinni, the erect inflorescence, which may elongate to over 20cm as it matures, and the lanceolate, long caudate leaves of up to 25 x 8cm. The type specimen has minute and easily overlooked pubescence on both surfaces, in other collections some bristle-like hair along the lateral veins of the upper surface, similar to that of *G. pendula* may occur; others are completely glabrous.

The flowers of *G. tricolor* are bright mauve-purple in bud, and open to reveal white and dull orange staminal parts. There is a small rounded anther-crest and the decurrent appendages point downwards from near the base of the thecae.

A collection from Matang, *Brooke* 9758 (BM), is recorded as having purple flowers, but the narrow leaves suggest that this plant is *G. brachyanthera*. In *Fl. Malesiana* 5:cclxiv (1950) reference is made to the fact that Miss Brooke's notes may, in some cases, be unreliable.

**6a. *G. tricolor* Ridley var. *gibbsiae* (Ridley) R. M. Smith, comb. et stat. nov.** Figs 3, 5B.

Type: Sabah, Royah hills, Tenom, abundant, flowers white, 2000ft, 1910, *Gibbs* 2827 (holo. BM).

Syn.: *G. gibbsiae* Ridley in J. Linn. Soc. Bot. 42:162 (1914).

Material seen:

SABAH: G. Lumarku, nr Sipitang, c.650m, in shade of tall rain forest, flowers white with orange tip, 20 iii 1980, *Argent & Lamb* 1487 (E); Kaintano ridge, S side of Trus Madi, on bare sandy stream side, primary rain forest, flowers orange tipped, 23-30 viii 1977, *Gardner* 26 (E); *ibidem*, 3000ft, not uncommon, flowers at first sight completely white, opening out into mainly orange components, 23-30 viii 1977, *Gardner* 15 (E); Tambunan rd, 1250m, montane dipterocarp forest, flowers cream white, 17 x 1983, *Beaman et al.* 7251 (E); Kinabalu Park, Penibukan, 5000ft, flowers cream white, 16 i 1933, *Clemens* s.n. (BM); *ibidem*, 4000ft, ridge E of Dahobang R, 2 xi 1933, *Clemens* 50125 (BM); *ibidem*, Dallas, 3000ft, flowers cream, fruit pink, 25 x 1931, *Clemens* 26822 (BM, K, UC); *ibidem*, above Poring Hot Springs, flowers white, 9 xii 1983, *Beaman et al.* 7826 (E); *ibidem*, Kiau, xi 1915, *Clemens* 9989 (UC); Kelauat, nr mile 10 from Tamparuli, 3000ft, edge of path, pure white flowers, 2 iii 1954, *Darnton* 249 (BM); Kota Belud distr., S of Sayup, 19-20 v 1984, *Beaman et al.* 9805 (E); Danum Valley, W of Sungei Purut to NE of G. Danum, 500m, shaded stream bank, leaves distinctly plicate, inflorescences both terminal and basal, rachis and lower pedicels [cincinni stalks] suffused with lilac, flowers white with orange tips, 13 iii 1987, *Argent et al.* 1987/149 (E).

SARAWAK: 4th Division, Mt Merapok, 1200ft, flower light green, white inside, *Native collector* s.n. (UC316002); G. Mulu National Park, S. Lansat, E of river, 165m, inflorescence whitish, bracts whitish green, flowers white and yellow, 17 i 1978, *Hansen* 29 (C, E); *ibidem*, Gua Payau,



Basseri Valley Main Forest Project  
Ulu Negaris, Sabah, E. Malaysia

No. 1907149 Date: 13 March 1907

Name Globba

Collector G. Argent, S. Ali and K. Koell

Locality West of Sg. Pumat, to NE of  
Gantung Dam

Habitat Shaded stream bank c. 500 m alt.

Notes

Clump-forming plants to 60 cm. Leaves  
distinctly plicate. Inflorescences both  
terminal and basal. Rachis and lower  
pedicels confluent with lilac. Flowers  
white with orange tips. SEE SHORT COLLECTION

*Globba tricolor* Ridley var.  
*gibbsiae* (Ridley) R. M. Smith  
Det. R. M. Smith, May 1987

A programme of research organized by Yusoff Sabah,  
Sabah State Dept. & Universiti Kebangsaan Malaysia  
(UKM) Clumped in collaboration with the Royal Society, London.

FIG. 3. *Globba tricolor* var. *gibbsiae*, showing basal and terminal inflorescences on the same plant.

on ground in alluvial rain forest, c.100m, inflorescence silvery white, 19 xi 1977, *Argent & Kerby* 805 (E); 5th Division, Bakelalan to Long Rapata, Mt Murud, nr camp 2, white and orange flowers, 15 x 1967, *Burt & Martin* B5523 (E); 3rd Division, Gilam Bakun, flowers cream and yellow, 23 viii 1954, *Brooke* 9084 (BM); Teneong, flowers white, 2 ix 1954, *Brooke* 9129 (E); 2nd Division, Mt Rayou, 600ft, flower white, 11 i 1928, *Native collector*, herb. Merrill, 5013 (UC).

KALIMANTAN: between Long Bawan and Panado, c.3°52'N, 115°42'E, 1200m, old secondary forest on sandstone, inflorescence white, 16 vii 1981, *Geesink* 9059 (L); *ibidem*, evergreen forest along streamlet on granite hills, G. Paris, inflorescence white, petals orange tinged, anther orange, 6 vii 1981, *Geesink* 8935 (L).

*G. tricolor* var. *gibbsiae* is not uncommon in W Sabah and N Sarawak, whereas var. *tricolor* is, as far as is known, almost entirely restricted to the 1st Division of Sarawak. The variety is distinguished by the white and yellow-orange flowers which bear no trace of purple, up to 10-flowered cincinni and in the usually more densely pubescent leaves. The lateral veins of the upper leaf surface have bristle-like hair similar to that of *G. pendula*, but shorter intervenous hairs are also present. The lower surface is minutely pubescent, often densely so; occasionally plants with glabrous leaves occur.

*G. tricolor* var. *gibbsiae* has flowered in cultivation at Edinburgh from collections made in Sabah of living material only (*Argent* 84/84; 97/84) thus providing an excellent opportunity to expand Ridley's rather inadequate description of the inflorescence. The entire structure is shining white in bud, the open flower has a bright yellow-orange labellum and anther. The labellum extends to just below the insertion of the petals and is bilobed in the lower third, not 'very nearly to the central channel' as described by Ridley. The anther appendages are exactly as in the species and there is a similar small rounded apical crest. The capsule is globose and trisulcate.

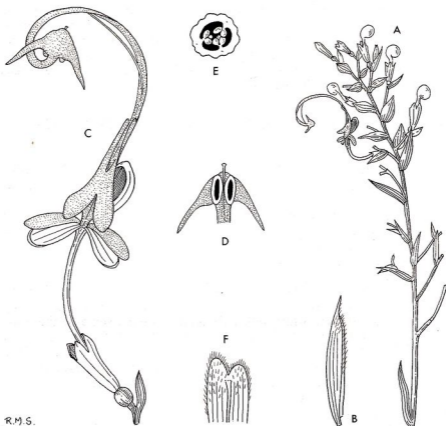
*Argent et al.* 1987/149 from the Danum Valley in SE Sabah is interesting, but not unique, in that inflorescences terminating a more or less leafless shoot (rudimentary laminae may be observed) were commonly found arising from the base of flower-bearing leafy shoots (Fig. 3). Holttum (1950) has recorded leafless inflorescences in *G. leucantha* as it occurs in the Malay Peninsula. In the living state the leaves of the Danum plant were markedly 'plicate'; this pleated appearance has been observed to some extent in the plants in cultivation referred to above but disappears completely in the dried state.

*G. tricolor* var. *gibbsiae* can scarcely be separated from *G. leucantha* Miq. as it occurs in the Malay Peninsula. However, *G. leucantha* was described from Sumatra (*Teysmann* 2035, n.v.) and Holttum (pers. comm. to Lim, 1967) reports that the type lacks the intervenous hairs on the upper leaf surfaces. It seems, then, only sensible to retain Ridley's epithets for the Bornean plants. The whole question of the correct name might be resolved after examination of two species described by Baker (*G. pallidiflora* in Hook. f., Fl. Brit. Ind. 6:204, 1890; Type: Johore, *King* 716, CAL n.v.; *G. floribunda* op. cit., 203. Type: Johore, *King* 714, CAL n.v.).

Pencil sketches of these types are at K, they show insufficient floral detail and no attempt was made to illustrate the indumentum.

7. *Globba muluensis* R. M. Smith, **species nova** *G. brachyantherae* var. *rubrae* inflorescentia rubra et anthera biappendiculata similis, sed cincinnis paucifloris, labello profunde bilobo et ligula inaequaliter biloba differt. Fig. 4.

Herba usque ad 50cm. Folia sessilia, 8–13 × 1.5–4cm lanceolata, acuminata, utrinque hirta; ligula 2–4mm, pubescens, irregulariter 2-loba; vaginae pubescentes. Inflorescentia rubra, usque ad 8cm longa, pedunculo 8–12cm longo; bracteae steriles ad 3 × 1.5cm, lanceolatae, pubescentes; bracteae fertiles ad 1.5 × 0.5cm, glabrae, cincinnos 2(–3)-floros subtendentes; bracteolae 0.5–0.8cm longae, glabrae; flores aurantiaci-rubri, brevissime pedicellati; calyx 0.5cm longus, 3-lobus; corollae tubus ad 2cm longus; lobi laterales 5 × 2–3mm, dorsalis 7 × 4mm breviter cucullatus; labellum 0.8–1cm longum, ultra trientem bilobum; staminodia lateralia 0.5–0.6cm longa; filamentum ad 2cm longum; anthera c.2mm longa,



R.M.S.

FIG. 4. *Globba muluensis*: A, inflorescence × 1; B, sterile bract × 2; C, flower × 3; D, anther and upper part of filament from the front × 3; E, ovary in T.S. × 4; F, ligule × 2 (from Hansen 461, A, B, F dried material, C, D, E, spirit material).

appendice laterali singula 2-3mm longa, e basi triangulari thecae deodorsum advertente, connectivo truncato vel in cristam parvam et rotundatum prolongato. Stigma ore ciliatum. Ovarium c.2-3mm, glabrum, placentatione parietali. Fructus ignotus.

Type: Sarawak, G. Mulu National Park, G. Mulu, W ridge nr camp 3, submontane mossy rain forest, c.1300m, bracts and perianth pink, flower dull yellow and translucent white, 30 iv 1978, *Argent & Coppins* 1139 (holo. E).

Other material seen:

SARAWAK: 4th Division, G. Mulu National Park, moss forest, open area where trees had fallen, inflorescence red, flowers white, red and orange, 15 iii 1978, *Hansen* 461 (C, E); *ibidem*, moss forest, peduncle red, flowers light red outside, pale orange within, 14 vi 1962 *Burt & Woods* B2093 (E); *ibidem*, Melinau gorge in swamp forest, orange red inflorescence, sheaths mottled dark red, 27 vi 1962, *Burt & Woods* B2317 (E); *ibidem*, sub-camp 5, shaded forest on river bank, c.400ft, alluvial forest floor litter, flowers and bracts salmon pink, 12 x 1977, *Lewis* 313 (K).

*G. muluensis* is characterized by the two-flowered, shortly stalked cincinni. The inflorescence is entirely red or pink except for the predominantly yellow-orange corollas. The flowers are large for the genus, up to 5cm long and the deeply bilobed labellum reaches to the insertion of the petals. The broad-based appendages point slightly downwards from the lower half of the anther. The unequally lobed ligule has not been observed in any other Bornean *Globba*.

**8. *G. brachyanthera*** K. Schum. in Bot. Jahrb. 27:329 (1899) & Pflanzenr. Zing. (1904). Fig. 5A.

Type: Sarawak: 1st Division, nr Kuching, vi 1865, *Beccari* 38 (n.v.).

Syn.: *G. brachyanthera* var. *angustifolia* Ridley in J. Str. Br. Roy. Asiat. Soc. 46:232 (1906). Type: Sarawak, 1st Division, Mt Matang, viii ?, *Ridley* s.n. (K).

*G. affinis* Rendle in J. Bot. 39:176 (1901). Syntypes: Sarawak 4th Division, Baram, Entoyut R, xi 1894, *Hose* 456 (n.v.); Baram, 25 x 1894, *Hose* 109 (E).

**var. *brachyanthera***

Material seen:

SARAWAK: Kuching, white, ix 1905, *Ridley* 12359 (K); *ibidem*, white, 1 i 1915 *Ridley* s.n. (BM); *ibidem*, 1893, *Bartlett* s.n. (BM); Mt Matang, Sungei China, flowers white with pale orange stigma, some of the lower leaves marked with purple below, 14 vii 1962, *Burt & Woods* B2503 (E); *ibidem*, 2500-3000ft, *Mjoberg* s.n. (UC315965); *ibidem*, flowers white, 18 vi 1927, *Native collector* (UC357374); *ibidem*, old jungle, 2400ft, flowers white, 1 xii 1927, *Native collector* s.n. (UC357621); *ibidem*, on wet ground at edge of forest path, 16 vi 1954, *Brooke* 8726 (BM); *ibidem*, inflorescence white, 13th mile Matang, 1 xii 1954, *Brooke* 9448 (BM); *ibidem*, flowers white, 16 vii 1927, *Native collector* 5214 (UC); 2500-3000ft, *Mjoberg* s.n. (UC315966); *ibidem*, white, i 1915, *Ridley* s.n. (BM); *ibidem*, 2500-3000ft, *Mjoberg* 244 (UC); *ibidem*, inflorescence white, anther orange, lip and lateral staminodes yellow-orange, cult. RBG

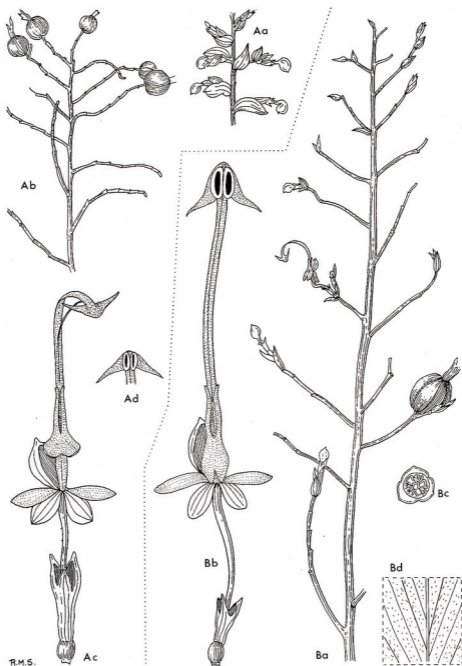


FIG. 5. A, *Glogba brachyanthera*; a, part of young inflorescence  $\times 1$ ; b, infructescence  $\times 1$ ; c, flower  $\times 3$ ; d, anther and upper part of filament from the front  $\times 3$  (a, c, d from living material of *Argent & Sinclair* 18; b from dried material of *Brooke* 9448) B, *G. tricolor* var. *gibbstae*; a, inflorescence  $\times 1$ ; b, flower  $\times 3$ ; c, fruit in T.S.  $\times 1$ ; d, upper surface of lamina  $\times 1$  (a, d from dried material of *Beaman* 7251; b, c, from living material of *Argent & Sinclair* 84).



Edinb. from *Argent & Sinclair* 18, acc. no. 820718 (E); *ibidem*, flower white, 1 xii 1927, *Native collector* 5170 (UC); Sungei Raya on ground in wet forest, flower white, 3 xi 1954, *Brooke* 9345 (BM); Bau, white, vii 1905, *Ridley* 11005 (K); without precise locality, collected for the Bureau of Science Manila, *Native collector* 461 (BM); Herb. Hook., *Lowe* s.n. (K).

The type of *G. brachyanthera* has not been found at either FI or K, but the above citations match Schumann's description well. His comment, '*habitu praecipue inflorescentiae generi Aneilematis simillima*' is apt, for the widespread many-flowered cincinni of the *mature* inflorescence are quite reminiscent of the Commelinaceous genus *Aneilema*. The species is characterized by the very short yellow-orange labellum, which is little more than emarginate at the apex, orange anther and otherwise white flowers. The short inflorescence averages c.9cm in length, the flowering part occupying about half of this, the usually white bracts are lanceolate to ovate and, in the young inflorescence, persistent; they subtend cincinni of up to c.15 flowers. The anther appendages project more or less horizontally from a broadly triangular base.

The length and width of the leaves (6–18 × 1.5–3cm) may vary within a single collection (e.g. *Burt & Woods* B2503) and *Ridley's* var. *angustifolia* cannot be upheld. In most of the material seen the lamina is practically glabrous, but some short pubescence may be found on the lower surface and, occasionally, longer, scattered hairs occur above. The ligule has a ciliate margin, the sheaths are more or less glabrous.

K. Schumann (1904) added an unlocalized collection by *Korthals* (L) to his type citation. This is a broad-leaved plant and probably belongs to *G. pendula*.

Rendle separated *G. affinis* from *G. brachyanthera* on the pilulose leaf sheaths and the anther being spurred from the base. In fact, the appendages are as in *G. brachyanthera* and the short labellum and lateral staminodes, which just exceed the petals in length also match exactly. The leaves are sparsely strigose above with shorter pubescence below which is almost entirely confined to the mid-rib.

**8a. *G. brachyanthera* var. *rubra* R. M. Smith, var. nov.** a var. *brachyanthera* inflorescentia bracteis rubris et floribus flavis differt.

Type: Sarawak: 4th Division, Lambir National Park, S of Miri, orange-red flowers [bracts], petals and 'dancing girl' [lip and lateral staminodes] pale orange-yellow, stem red with green mottling, 5 vii 1962, *Burt & Woods* B2363 (holo. E).

Material seen:

SARAWAK: 3rd Division, Ga Amau, Ulu Mujong, Balleh, rich pink flower, 15 iv 1964, *Ashton* S21253 (K); Hose Mts, base of B. Kajang, 1100m, inflorescence magenta, flower rich orange-red, 24 iii 1964, *Nyudong* S17208 (K); 4th Division, Lambir National Park, S. Liam Liban, common on streambanks, inflorescence red, corolla orange-yellow, 19 ix 1978, *Burt* 11541 (E); *ibidem*, Miri, flower and fruit red, 28 ii 1966, *F. G. Awang Morshidi* S22894 (E); 5th Division, Mt Merapok, 1200ft, red with yellow tip, *Native collector* s.n. (UC315960); *ibidem* (UC316033); *ibidem* (UC316035); *ibidem* (UC316000); nr Lawas, inflorescence scarlet,

11 vii 1955, *Brooke* 10244 (BM); Lawas, on ground and on rocks in forest, inflorescence scarlet, flowers buff, 31 viii 1955, *Brooke* 10557 (BM); *ibidem*, 22 v 1955, *Brooke* 9935 (BM); 7th Division, Kapit, Upper Rejang, flowers [bracts] red, *Native collector* s.n. (UC357421).

KALIMANTAN: Sanggau, inflorescence dark red, also the fruit, flower orange-yellow, 8 iv 1973, *Elsener* 243 (E).

The older inflorescences of var. *rubra* show Schumann's 'Aneilema' characteristic admirably. As in the species, narrow-leaved plants occur and there is also variation in leaf-indumentum, ranging from leaves which are hirsute on both surfaces to those which are completely glabrous below.

The variety is characterized by the red inflorescence and yellow-orange flowers and, in the young stage might be confused with the similarly coloured *G. muluensis*, but that has 2-flowered cincinni. Three collections from the 3rd Division of Sarawak (Muka Hill, UC357284, 357285 and Teneong, *Brooke* 9318, BM) deviate in the much larger (to 26 x 7cm) leaves.

**8b. *G. brachyanthera* var. *hirsuta* R. M. Smith, var. nov. a var. *brachyanthera* foliis utrinque pagina hirsuta differt..**

Type: Sarawak; 1st Division, S. Lundu, below G. Perigi, white flowers with dull yellow stigma, appendages and pale yellow sepals, 6 viii 1962, *Burt & Woods* B2711 (holo. E).

Syn.: *G. burbridgei* Ridley in J. Bot. 62:204 (1925). Lectotype (selected here): Sarawak, 1st Division, Lundu, iv 1924, *Mjoberg* 233 (lecto. BM, iso. K).

Material seen:

SARAWAK: 1st Division, Mt Poi (presumably G. Berumpet), 1200ft, old jungle, flowers white, 2 xi 1927, *Native collector* s.n. (UC357403); *ibidem*, 2400ft, old jungle, 8 xi 1927, *Native collector* s.n. (UC357548).

The variety is characterized by the long hair which covers both surfaces of the leaves. The inflorescence is as in the species with predominantly white flowers and the leaf shape is similarly variable. Ridley cited two further collections, both from Sabah, under *G. burbridgei*; these are here referred to *G. pendula* (no. 5 above).

Imperfectly known species:

***G. glandulosa* Ridley in J. Roy. Asiat. Soc. 49:43 (1906).**

Type: Sarawak; 2nd Division, Mt Lingga, flowers light purple or red, undersurface of leaves with red brown tinge, *Hewitt* 37 (K).

In a previous paper (Smith, 1982), *G. glandulosa* was placed in synonymy under *G. affinis* Rendle, now included in *G. brachyanthera* (no. 8 above). This decision was both hasty and unwise, and careful examination of the single, immature flowers found on the type collection indicate that the distinctly bilobed labellum is not like that of *G. brachyanthera* and that the lateral staminodes are much shorter than the petals. The number of flowers in each cincinni is impossible to distinguish in such a young inflorescence but seems likely to be few. The leaves are hirsute on both surfaces.

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